

CLAIMS

We claim:

1. A method for thermal desorption of contaminants in soil comprising:
 - a. excavating the contaminated soil;
 - b. placing the contaminated soil in a thermally conductive treatment vessel containing a gas exit pathway;
 - c. transporting the treatment vessel to an insulated treatment chamber;
 - d. installing the treatment vessel in the treatment chamber;
 - e. inducing flow of air through an air dryer;
 - f. inducing flow of the dried air through an air heater;
 - g. heating the dried air;
 - h. inducing flow of the dried and heated air into the treatment chamber to contact the treatment vessel and flow through the contaminated soil to the gas exit pathway;
 - i. exhausting heated air and contaminants from the gas exit pathway;
 - j. stopping flow of the dried and heated air when the soil is decontaminated;
 - k. removing the treatment vessel from the treatment chamber;
 - l. transporting the treatment vessel to the soil disposition site; and
 - m. transferring the soil from the treatment vessel to the disposition site.
2. The method for thermal desorption of contaminants in soil in claim 1 further comprising cooling the air exhausted from the gas exit pathway.
3. An apparatus for thermal desorption of contaminants from a mixture of soil and rocks comprising:
 - a. a treatment vessel consisting of a floor with an inner side and outer side, a first side with an inner side and outer side, a second side with an inner side and outer side, a first end with an inner side and outer side, and a second end with an inner side and outer side, and a gas exit pathway;
 - b. the vessel is configured such that the vessel inner sides may contain contaminated soil exposed at the top of the vessel and the gas exit pathway is arranged to be at a predetermined location within the contaminated soil such that gases in the contaminated soil may be directed to the gas exit pathway;

- c. a treatment chamber with an opening, a closure for the opening, an incoming air penetration, insulation, and a gas exit pathway penetration, the opening configured such that a treatment vessel may be inserted or removed through the opening when the closure is in the open position, the incoming air penetration configured such that the incoming air is directed external to the treatment vessel when the vessel is located in the treatment chamber, and the treatment chamber gas exit pathway penetration arranged such that treatment air is directed through the soil to the treatment vessel gas exit pathway, then exits the treatment chamber through the penetration;
 - d. at least one air dryer and at least one air blower arranged such that the dryer removes moisture from the incoming air to the treatment chamber prior to the blower directing the air from the dryer to the treatment chamber;
 - e. at least one electric air heater arranged such that the air is heated prior to being directed into the treatment chamber; and
 - f. at least one gas extraction blower arranged such that gases in the gas exit pathway are directed to exit the treatment chamber wherein the dry, heated air directed into the treatment vessel transfers heat to the contaminated soil through the treatment vessel floor, sides, and ends and is directed through the contaminated soil, heating the soil by contact before entering the gas exit pathway and exiting the treatment chamber.
4. The apparatus for thermal desorption of contaminants from a mixture of soil and rocks as in claim 3 further comprising the treatment chamber contains a heat exchanger arranged such that the exhaust of an engine driven electric generator is directed through the heat exchanger providing heat to the chamber.
 5. The apparatus for thermal desorption of contaminants from a mixture of soil and rocks as in claim 3 further comprising an exhaust cooling system cooler arranged with an exhaust cooling system water injection pipe such that water in the lower portion of the cooler is directed through the pipe to mix with the gases in the gas exit pathway causing cooling of the gases by water vaporization, and the portion of the water not vaporized returned to the cooler with the flow of gases.

6. The apparatus for thermal desorption of contaminants from a mixture of soil and rocks as in claim 3 further comprising an exhaust cooling system cooler arranged with a refrigeration system such that cooling of the exhaust gas is provided by the refrigeration system refrigerant where the cooler is the refrigeration cycle evaporator.
7. An apparatus for heating contaminated soil to remove contaminants comprising:
 - a. a thermally conductive treatment vessel configured such that the vessel may be filled with contaminated soil exposed at the top of the vessel;
 - b. a gas exit pathway arranged within the soil in the treatment vessel; and
 - c. a treatment chamber arranged with:
 - means for installation of the treatment vessel within the chamber,
 - means for heating the chamber interior with dried and heated air,
 - means for directing the heated air through the contaminated soil in the treatment vessel,
 - means for removing the heated air from the treatment vessel gas exit pathway, and
 - means for withdraw of the treatment vessel from within the chamber.
8. The apparatus for heating contaminated soil to remove contaminants as in claim 7 further comprising:
 - a. means for transport of the treatment vessel from a contaminated soil location; and
 - b. means for transport of the treatment vessel to a soil disposition site.